EMERGENCY ISSUE Price 6d.

THE ENGINEER

JUNE 26, 1959 | 28 ESSEX ST., STRAND, LONDON, W.C.2 | VOL. 207 No. 5396

PUBLIC APPOINTMENTS

UNIVERSITY OF AUCKLAND, NEW ZEALAND

LECTURESHIP OR SENIOR LECTURESHIP IN CIVIL ENGINEERING

Applications are invited for the above post. Candidates should be University graduates in Civil Engineering and have had some professional experience. A professional qualification in land surveying and a specialised knowledge of Public Health Engineering would be advantageous.

The appointment will be made either at the grade of Lecturer or Senior Lecturer, depending upon the qualifications of the successful applicant. The salary scale for a Senior Lecturer is £1315–£1615 per annum, rising by three annual increments, and for a Lecturer £1025–£1275 per annum, by three annual increments. An allowance is made towards travel and removal expenses.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 36, Gordon Square, London, W.C.1.

Applications close, in New Zealand and London, on 15th August, 1959. E6759

ROYAL COLLEGE OF SCIENCE AND TECHNOLOGY, GLASGOW

(AFFILIATED TO THE UNIVERSITY OF GLASGOW)

DEPARTMENT OF MECHANICAL, CIVIL AND CHEMICAL ENGINEERING

LECTURER OR ASSISTANT LECTURER IN SURVEYING

Applications are invited for a LECTURESHIP or ASSISTANT LECTURESHIP IN SURVEYING within the Civil Engineering Section of the Department. Applicants should hold a recognised qualification in Surveying or Engineering, have had practical or research experience in the subject and be acquainted with modern developments.

Salary scales : Assistant Lecturer, £750 by £50 to £850 ; Lecturer, £900 by £50 to £1350 by £75 to £1650.

Further particulars and application forms can be obtained from the Secretary, The Royal College of Science and Technology, Glasgow, C.1. E6773

UNIVERSITY OF AUCKLAND, NEW ZEALAND

LECTURESHIP OR SENIOR LECTURESHIP IN MECHANICAL ENGINEERING

Applications are invited for the above post. Candidates should be University graduates in Mechanical Engineering. Previous lecturing experience is not necessary, especially if the candidate has had suitable professional experience in industry.

The appointment will be made either at the grade of Lecturer or Senior Lecturer, depending upon the qualifications of the successful applicant. The salary scale for a Senior Lecturer is £1315–£1615 per annum, rising by three annual increments ; and for a Lecturer is £1025–£1275 per annum, by three annual increments. An allowance is made towards travelling expenses.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 36, Gordon Square, London, W.C.1.

Applications close, in New Zealand and London, on 15th August, 1959. E6758

UNIVERSITY OF MANCHESTER

APPOINTMENTS

Applications are invited for the following additional posts in the Faculty of Science :—

75/59 (additional) : READER or SENIOR LECTURER IN ENGINEERING PHYSICS.

76/59 (additional) : SENIOR LECTURER IN ENGINEERING (Mechanical).

81/59 (additional) : LECTURER IN ENGINEERING (Civil).

82/59 (additional) : LECTURER IN ENGINEERING (Mechanical).

83/59 (additional) : LECTURER IN MECHANICS OF FLUIDS.

Duties to commence October 1st, 1959. Salary scales per annum as follows :—Reader, £1800 to £2150 ; Senior Lecturer, £1700 to £2050 ; Lecturer, £900 to £1650 ; initial salary according to qualifications and experience. Membership of F.S.S.U. and children's allowance scheme.—Applications should be sent not later than July 4th, 1959, to the Registrar, The University, Manchester, 13, from whom further particulars and forms of application may be obtained. E6779

PUBLIC APPOINTMENTS

ROYAL NAVAL SCIENTIFIC SERVICE

SENIOR SCIENTIFIC OFFICERS AND SCIENTIFIC OFFICERS

Vacancies for SENIOR SCIENTIFIC OFFICERS and SCIENTIFIC OFFICERS in following localities :

LONDON AREA : MECHANICAL ENGINEER with sound knowledge of basic principles of thermo and fluid dynamics, to carry out research programme in a particular field of applied hydrodynamics. Experience in modern methods of design and research on axial flow compressors, turbines or pumps an advantage. MECHANICAL ENGINEER for work on propulsion problems. APPLIED MATHEMATICIAN for research of basic nature on stability of underwater vehicles ; knowledge of theoretical hydrodynamics and theory of control systems an advantage. APPLIED MATHEMATICIAN or THEORETICAL PHYSICISTS for acoustic analysis. ELECTRONIC PHYSICISTS for data handling and analysis problems. PHYSICIST interested in operator performance. CLASSICAL PHYSICISTS.

BALDOCK : PHYSICISTS or APPLIED MATHEMATICIANS for research in Metal or Quantum Physics.

PORTSMOUTH : ELECTRONIC ENGINEERS for research on analogue computers and transistor circuits. ELECTRICAL ENGINEERS for research on small rotating electrical machinery. PHYSICISTS—for optical systems and instrumentation. ELECTRO-MECHANICAL ENGINEERS—for work on servo-mechanisms.

PORTLAND : PHYSICISTS or APPLIED MATHEMATICIANS for research on underwater acoustics. ELECTRONIC PHYSICISTS, ELECTRONIC ENGINEERS—for design work. PHYSICAL CHEMISTS.

POOLE : CHEMICAL ENGINEERS. CHEMISTS for work on rubber technology.

ROSYTH : PHYSICISTS (Electronic).

Candidates must normally be natural born British subjects of natural born British parents, with First or Second-Class Hons. Degrees. S.S.O.s must have had three years' post-graduate experience and be not less than 26 years of age. Salaries : (men) S.S.O., £1233–£1460 ; S.O., £655–£1150 (London), somewhat lower in provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between ages of 21 and 32 to compete for established posts.

Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1 (quote A.220/9A). E5866

GOVERNMENT OF QATAR—PERSIAN GULF

ASSISTANT DESIGN ENGINEER

The Government of Qatar, in the Persian Gulf, invites applications from Graduate Civil Engineers seeking practical design experience, for the post of ASSISTANT DESIGN ENGINEER in the State Engineer's Office.

Applicants must have passed or be exempted from taking Parts A and B of the Associate Membership Examination of the Institution of Civil Engineers.

Work includes the structural design of buildings and general civil engineering designs connected with a rapidly developing town of about 30,000 people.

SALARY : Starting at Rupees 1775 per Arabic month (equivalent to £1598 per annum), with annual increments of Rs.75/– a month to a maximum of Rs.1925 per Arabic month. **A three-year contract is offered subject to six months' probationary period.** Gratuity payable on completion of contract. Leave six days for each month of duty. Free passages, accommodation, fuel, light and water. No income tax.

APPLICATIONS, endorsed "Assistant Design Engineer," should be sent in duplicate to : C. Tennant Sons and Co., Ltd., 4, Copthall Avenue, London, E.C.2, giving full details of training, &c., age, nationality, religion, marital status, the names of three referees and a recent dated photograph. E6093

SHEFFIELD CORPORATION WATERWORKS

CHIEF ASSISTANT (HEAD WORKS)

Applications are invited for this post, J.N.C. Scale "A" (£1215–£1390) on the staff of the General Manager and Engineer, J. Noel Wood, M.I.C.E. Commencing salary according to qualifications and experience.

Applicants must be Chartered Civil Engineers with experience in the design and construction of water treatment plant, control of staff and supervision of large contracts.

The appointment is subject to national conditions of service as applied by the City Council. Superannuable post ; medical examination.

Alternate Saturday morning leave ; car allowance. Attractive housing accommodation available to rent.

Applications stating age, qualifications, experience, present and past appointments (with dates and salaries) and quoting the names and addresses of two referees, must reach the undersigned by 9th July, 1959.

JOHN HEYS,
Town Clerk.

Town Hall,
Sheffield, 1. E6764

PUBLIC APPOINTMENTS

CITY OF LEEDS

WATERWORKS DEPARTMENT

APPOINTMENT OF STAFF

Applications are invited for the following appointments :

(a) ENGINEERING ASSISTANT (APT. IV), £1065–£1220.

(b) ENGINEERING ASSISTANTS (3 posts) (APT III), £880–£1065.

(c) DRAUGHTSMAN (HGD), According to age—Maximum £595.

Applicants for post (a) must be Corporate members of the Institution of Civil Engineers. Experience in the design and construction of reinforced concrete water retaining structures and/or Impounding Reservoir Schemes will be an advantage.

Applicants for posts (b) should be Graduates of the Institution of Civil Engineers or have a University Degree or equivalent qualification. Experience with a Water Undertaking will be an advantage. For one of the posts experience in the design and installation of pumping plants is desirable.

Applicants for post (c) should be neat draughtsmen and experience in Civil Engineering drawings will be an advantage.

Superannuation payable. Medical examination.

Applications should be delivered not later than 12 noon on Thursday, 2nd July, 1959, endorsed with the description of the post applied for.

Canvassing disqualifies.

KENNETH L. FORSTER,
General Manager and Engineer.

Waterworks Department,
Civic Hall,
Leeds, 1.
12th June, 1959. E6748

WOKING AND CHERTSEY GROUP H.M.C.

WORKS ASSISTANT

WORKS ASSISTANT required to assist Building Supervisor in connection with 12 hospitals. Salary at age 21, £415 p.a., rising to £625 p.a.

Apply, stating age, experience and qualifications, &c., within 10 days, to Group Secretary, Huntington, Guildford Road, Chertsey, Surrey. E6775

FOR SALE

MINISTRY OF TRANSPORT AND CIVIL AVIATION

TUBULAR BERTH FRAMES FOR SALE

1. The Minister of Transport and Civil Aviation invites OFFERS for the PURCHASE from him of the undermentioned TUBULAR BERTH FRAMES "ex stores" :—

Manufactured of tubular steel 1¼in. in. external diameter and 6ft. 1in. by 2ft. 1in. external dimensions, with or without lee rails. Weight approximately 22 lb. each without lee rails, 28 lb. each with lee rails.

Chains, canvas bottoms and lacings can be supplied additionally if required.

2. Offers for these Berth Frames or for any quantity not less than 50 in number will be considered from any person.

3. Offers should be made in writing to the Ministry of Transport and Civil Aviation, Room 5099, Berkeley Square House, London, W.1, and should arrive not later than 16th July, 1959. Envelopes should be clearly marked "Tender for Tubular Berth Frames."

4. The Frames are lying at the Sea Transport Stores Depot, Old Redbridge Road, Redbridge, Southampton, and can be inspected between the hours of 10 a.m. and 4 p.m., from Monday to Friday, by arrangement with the Stores Officer, Tel. No., Southampton 24605.

5. The Minister will not accept responsibility for any errors or omissions in the description of the Berth Frames or for any information which the person submitting an offer may have obtained from any person whomsoever.

6. The Minister does not bind himself to accept any offer for purchase, and his decision in any case must be accepted as final.

R. W. BULLMORE,
Signed by authority of the Minister of Transport and Civil Aviation at Berkeley Square House, London, W.1, this 5th day of June, 1959.

E6762

EDUCATIONAL

A.M.I.MECH.E., B.Sc., City and Guilds, &c. Guarantee Postal Courses for all Exams. and Technical Divisions from Elementary to Degree standard including Automation Techniques. Approximately 95 per cent successes. 148-page prospectus free on request.—B.I.E.T. (Dept. 22), 29, Wright's Lane, London, W.8. E114 E

ELECTRONICS, covering practical and theoretical aspects, basic principles, Industrial applications, electronic apparatus, &c. Guaranteed coaching for Brit.I.R.E., City and Guilds, &c. Study at home under highly qualified tutors.—Write for free book : International Correspondence Schools, 71, Kingsway (Dept. 446A), London, W.C.2. E157 E

EDUCATIONAL

AUTOMATION.—AUTHORITATIVE COURSES are now available in Digital and Analogue Computer Technology, Applied Electronics, Data Processing and Instrumentation up to professional level by home study. Individual enrolment or industrial group scheme enrolments accepted. Syllabuses and prospectus sent on request.—Write (Dept. S.E.8), E.M.I. Institute School of Electronics, College House, Kensington, London, W.8. E145 E

TECHNICAL HOME STUDY COURSES

For A.M.I.Mech.E., A.M.I.Chem.E., A.M.I.M.I., A.F.R.Ae.S., C. & G., &c.

OVER 50 FIRST PLACES and more than 2000 Passes have been secured by T.I.G.B. Students at Professional Engineering Examinations. We have a wide range of exclusive Home Study Courses in all branches of Engineering—Mechanical, Electrical, Aeronautical, Automobile, Chemical, Gas, Radio, and Television, Draughtsmanship, &c. Textbooks, blueprints, &c., are provided and, if desired, fees may be paid by moderate instalments.—Write (stating subject of interest) for copy of 110-page Prospectus FREE and without obligation.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN
(Dept. 76),
29 WRIGHT'S LANE, LONDON, W.8.
E102 E

TENDERS

WARWICKSHIRE COUNTY COUNCIL

TO HEATING AND ELECTRICAL ENGINEERS

Firms desirous of having their names placed upon a list of approved contractors from whom the Warwickshire County Council will invite tenders for schemes costing £1250 and over for :

1. Heating, Hot and Cold Water Supplies, Gas and Steam Services ;

and/or

2. Electric Light and Power Installations,

should make application on or before Monday, the 17th August, 1959, to G. R. Barnsley, F.R.I.B.A., County Architect, Shire Hall, Warwick.

When submitting their applications, applicants must clearly indicate the maximum financial amount of individual contracts for which they wish to be considered and must forward particulars of contracts recently executed by them, giving the names and addresses of local authorities or persons to whom reference can be made.

Tenders will be considered only from firms included in the official list, which will be compiled by the appropriate Committee after consideration of applications.

Contractors whose names are already included on the Council's approved list need not make application.

L. EDGAR STEPHENS,
Clerk of the Council.

Shire Hall,
Warwick,
June, 1959. E6774

SITUATIONS VACANT

APPLICANTS ARE ADVISED TO SEND COPIES NOT ORIGINALS, OF THEIR TESTIMONIALS UNLESS OTHERWISE REQUESTED.

DAVY AND UNITED ENGINEERING COMPANY, LIMITED, Britain's largest organisation of rolling mill and auxiliary plant manufacturers, invite applications from ambitious qualified men interested in heavy engineering for positions as PROJECTS ENGINEERS. Successful applicants would have experience of steel and non-ferrous rolling mills of all types and will be responsible for engineering machinery prior to tendering. Items range from individual units to complete rolling mill plants. All contracts, irrespective of size, have to be individually engineered, offering a wide range of interest and unlimited scope for ingenuity and initiative. Excellent working conditions in modern building. Dining facilities, contributory pension scheme.—Apply in writing with details of age, experience, qualifications, &c., to : Personnel Department, Davy and United Engineering Company, Ltd., Darnall Works, Sheffield, 9. E6766 A

DEPUTY CHIEF MECHANICAL ENGINEER required immediately by British firm of Consulting Engineers, for 3-year contract in India. Applicants should have good all-round steelworks engineering experience, particularly construction and installation of new plant. Administrative ability is also required. Successful applicant will be exempt from Indian income tax from date of appointment until April, 1962. Apply, with full particulars.—BOX No. E6769, "The Engineer." A

SITUATIONS VACANT

DE LA RUE BULL MACHINES LIMITED

a subsidiary of The De La Rue Co., Ltd.

offer an interesting career with excellent opportunities for advancement to

INSTRUMENT TECHNICIANS

for work on fault finding, repair and maintenance of electro-mechanical and electronic equipment employing punched cards, punched paper tape and magnetic tape techniques.

Applicants should be between 25–30, possess the G.C.E. at "O" level or an O.N.C. or an Armed Forces examination of equivalent standard AND have completed either an apprenticeship in electro-mechanical instrument engineering or have successfully completed the equivalent Armed Forces trade training. City and Guilds or H.N.C. and similar qualifications an advantage. Knowledge of French desirable but not essential.

Appointments involve a six months training period in Paris starting in September, 1959. Subsequent employment in the U.K. on machine maintenance will be organised on a regional basis.

Initial salary will be £750–£950 per annum according to qualifications and experience. Appropriate allowances will be paid to cover lodgings expenses during training period. There is an excellent pension scheme.

Please apply in writing, stating full details of age, education, qualifications and experience, to :

Chief Personnel Officer,
THE DE LA RUE COMPANY, LTD.,
84-86, Regent Street, W.1.

as soon as possible.

Candidates short listed for interview will be required to take a simple competitive written test in electro-mechanical engineering and also a short practical test. These will be held early in July.

E6781 A

DESIGN DRAUGHTSMAN required for mechanical design of nucleonic instruments. Pleasant working conditions. Excellent rates of pay.—Apply Chief Draughtsman, ISOTOPE DEVELOPMENTS, LTD., Beenham Grange, Aldermaston, Berks. Tel. : Woolhampton 451. E152 A

DESIGNER - DRAUGHTSMAN, aged 25/40, required by an engineering company in Sussex. Applicants, preferably of H.N.C. standard, should be capable of stressing pressure and vacuum vessels, and be able to produce compact layouts of heat exchange plant, pumps and interconnecting pipework and valves with the minimum of supervision. This is a senior appointment carrying an appropriate salary. Please submit full details of experience.—BOX No. E6765, "The Engineer." A

ELECTRICAL ENGINEER, SOUTH AMERICA

A vacancy exists for a SENIOR DISTRIBUTION ENGINEER in a progressive overseas electricity Undertaking. Candidates must possess at least H.N.C. in Electrical Engineering and preferably be Corporate Members of the Institution.

The age limit is about 40 and several years' experience must have been gained in both planning and execution of high and medium voltage transmission and distribution systems.

For the right man, the vacancy is permanent. Full details of age, marital status, education, qualifications and experience, to : Messrs. Macknes and Shipley, Parliament Mansions, Abbey Orchard Street, London, S.W.1, quoting reference 2450. E6706 A

A. JOHNSON AND CO. (LONDON) LTD.

require for their Acton works MECHANICAL DRAUGHTSMAN with a Higher National Certificate, preferably with experience in stainless steel fabrication. Non-contributory pension scheme. Permanent position offering good scope to the right man.—Replies to Africa House, Kingsway, W.C.2. E6778 A

LEADING LOADING SHOVEL MANUFACTURERS HAS VACANCY for a DESIGN DRAUGHTSMAN for the Design and Progressing of New Developments in Hydraulic Loading Shovels. Applicants should have experience in medium general engineering fabrication and transmission design and should be able to work with a minimum of supervision. H.N.C. minimum qualification.

Apply in writing to Chief Designer, F. E. WESTHERILL, LTD., Tewin Road, Welwyn Garden City, Herts. E5980 A

MECHANICAL ENGINEER, Degree or A.M.I. Mech.E., to be responsible for design and technical sales of couplings. Previous experience should preferably include responsibility for project development. Competency as a design and development engineer matched with personality and enthusiasm are essential. This is a senior appointment with commensurate salary. Excellent life assurance and pension scheme in operation. Location : Leicestershire. Write fully about your education and career in strict confidence.—BOX No. E6079, "The Engineer." A

MECHANICAL/ELECTRICAL ASSISTANT required by Quantity Surveyors' London Office for Site Measuring and Negotiating Final Accounts. Reasonable knowledge all services, including air conditioning, necessary. Write, stating age, experience in this field and salary range.—BOX No. E2456, "The Engineer." A

MECHANICAL ENGINEER for European-managed company in Colombo, Ceylon. Applicants, 26/36 years of age, should have served apprenticeship with engineering company, have reasonable academic qualifications and subsequent responsible experience in estimating, supervision, installation and maintenance of machinery, including diesel engines, pumps and power transmission equipment.—Write, BOX Z.71, W.P.S., Thavies Inn House, Holborn Circus, E.C.1. E6768 A

SENIOR DRAUGHTSMAN/DEVELOPMENT ENGINEER required with experience in machine tools as applied to punching, shearing and guillotine machines. Applicants must have sound workshop and drawing office experience. The position is progressive, offers good opportunities and a good salary will be offered to the right man. DRAUGHTSMAN required with machine tools experience as applied to punching, shearing and guillotine machines. Applicants must have sound engineering training and be prepared to work on own initiative. The above positions are pensionable and in the Manchester area.—BOX No. E6030, "The Engineer." A

STEWARTS AND LLOYDS, LIMITED,

have a vacancy for a

SENIOR

in the Methods Department of their Tollcross Steel Foundry. Applicants should preferably have worked with both alloy and plain carbon steel castings, in the weight range up to 6 tons, but more important is a thorough practical knowledge of modern steel foundry methoding.

Written applications, giving full particulars of Education, Age and Experience, should be addressed to the Manager, Personnel Services, Clyde Tube Works, Coatbridge. E6732 A

THE GLACIER METAL COMPANY, LTD.

invites applications for the post of

CHIEF PRODUCTION ENGINEER SERVICE GROUP

The person appointed will work as a member of the Company's Technical Division attached to the General Manager Service Group. This Group, with Headquarters in London, consists of three engineering units situated in London, Glasgow and Manchester, engaged on the specialised manufacture white metalling and repair of bearings of widely varying sizes, predominantly heavy and medium, all involving short runs.

The Chief Production Engineer is responsible for the framework of technical methods used in the Group. He has to work out and recommend to his General Manager policy concerning standards of performance, techniques of manufacture, developments required and plant and equipment to be bought. He must ensure that the General Manager's policy is implemented throughout the Group.

Candidates should have an engineering degree or equivalent and some knowledge of metallurgy would be an asset. Experience of machine tools and of jobbing work would be an advantage and a strong capacity for imaginative perceptive planning is required. Though based on London, some travelling will be necessary.

There are excellent career prospects. Salary range : £1650–£2150 per annum. Candidates in their 30's are likely to be most suitable, but others will be considered.

Applications should be sent to
Personnel Director,
Glacier Metal Company,
Ealing Road, Alperton, Wembley, Middlesex.

E6782

YOUNG ENGINEER required for training in centrifugal pump design. Applicant should have good knowledge of hydraulics. Electrical design experience desirable but not essential. Good prospects for suitable applicant. Near S.E. London district.—BOX No. E6776, "The Engineer." A

YOUNG MEN REQUIRED to train for managerial posts in a progressive steelworks. Preference will be given to applicants holding H.N.C. or equivalent in Metallurgy or Engineering. Previous steelworks experience not essential. Salary will be commensurate with qualifications and experience. These are positions with very good prospects. Staff position, pension and free life assurance schemes, &c. Please apply, stating age, qualifications and experience.—BOX No. E6709, "The Engineer." A

UGANDA CEMENT INDUSTRY LIMITED
CHIEF ENGINEER

Applications are invited for the post of Chief Engineer at the Industry's cement factory at Tororo, Uganda.

Applicants should be qualified in Electrical as well as Mechanical Engineering and experience in the cement industry will be advantageous.

The contract offered will be for three years in the first instance, within the salary scale £1800 by £50 to £2000 per annum. Terms of service include six months' vacation leave after three years, with passages paid up to three adult fares, free partly-furnished quarters and free medical attention in accordance with the Industry's scale. The successful applicant will be required to join the Pension Scheme.

Details of experience and qualifications should be addressed to Uganda Development Corporation Limited, Uganda House, Trafalgar Square, London, W.C.2. E6771 A

VEHICLE MANUFACTURER requires SENIOR and JUNIOR DRAUGHTSMEN for work on interesting press work project in the South London area. Canteen facilities, pension scheme. Salary in accordance with capabilities.—Apply, BOX E310, L.P.E., Romano House, 399/401, Strand, London, W.C.2. E6780 A

GOVERNMENT SERVICE
ENGINEERING DRAUGHTSMEN

Government Communications Headquarters have vacancies at Cheltenham for Mechanical and Electrical Draughtsmen with design experience in any three of the following categories :—

Electronic equipment (rack mounted type, &c.).
Electrical work and small mechanisms.
Micro-wave equipment.
Fabricated parts, sheet metal work, outdoor structures.

Applicants should also have served a recognised engineering apprenticeship or have equivalent workshop knowledge, and preferably hold the Ordinary National Certificate.

There are opportunities for permanent and pensionable appointments and advancement to higher drawing-office posts. Facilities given to study for National Certificates and other Courses in approved cases.

Three-and-a-half weeks' annual leave, plus all public and privilege holidays.

Write to :
Personnel Officer,
G.C.H.Q. (D.O./15),
53, Clarence Street,
Cheltenham,
Glos. E6065 A

ATOMIC ENERGY ESTABLISHMENT,
WINFRITH, DORSET.

PROFESSIONAL ENGINEER is required by the Industrial Chemistry Group to lead a section providing an engineering service to Industrial Chemists. The Group's prime responsibilities are the treatment and disposal of radioactive wastes and chemical services to reactor projects.

Duties will include the development of new plant from basic requirements which will involve close liaison with scientific staff and the preparation of flowsheets and basic specifications.

Applicants should be Corporate Members of a Senior Engineering Institution and experience in two or more of the following fields is essential : Vacuum equipment and pressure vessels, Chemical plant, Medium to heavy mechanical equipment. Remote handling equipment.

A knowledge of methods used in radio-active wastes disposal would be an advantage.

Salary : £1345–£1800 p.a.

Housing ; superannuation scheme ; generous leave allowance and good working conditions.

Send Postcards for application form and further details to Personnel Branch (W.127/25), U.K.A.E.A., A.E.E., Winfrith, Dorchester, Dorset, not later than 25th July, 1959.

E6761 A

STOTHERT & PITT, LTD.,
BATH,

invite applications from

DESIGNER/DRAUGHTSMEN

with experience in or akin to any of the following
VIBRATING ROLLERS, QUARRYING PLANT,
TRUCK MIXERS, CONCRETE MIXERS,
ASPHALT PLANTS, CONCRETE BATCHING PLANTS
AND ALLIED EQUIPMENT

Local interviews can be arranged, but we prefer you to visit our works for a tour of inspection, when all aspects of the work can be seen at first hand. Travelling expenses will be paid to selected applicants. GOOD SALARIES will be paid based on experience and qualifications. Assistance will be given in obtaining housing accommodation where required.

General conditions of employment are excellent. Applications, in writing or by telephone, giving details of age, experience and qualifications, which will be TREATED IN THE STRICTEST CONFIDENCE, should be made to the CHIEF ENGINEER, CONTRACTORS' PLANT DEPARTMENT, STOTHERT AND PITT, LTD., BATH (Telephone : Bath 2277).

E6770 A

NORRIS CONSULTANTS LTD.,

in view of a two-year expansion programme, require for their London and Bristol Offices and elsewhere in the U.K., Senior and Junior Engineers, Designers and Draughtsmen in the following fields.

CIVIL ENGINEERING & SERVICES DIVISION
Reinforced Concrete, Heating, Ventilating, Air Conditioning, Refrigeration, Pipework and General Services, Structural Steelwork, Electrical (Heavy and Light current).

PRODUCTION & MECHANICAL DIVISION
Special purpose machines, Transfer Systems, Jigs and Tools, General mechanical, Mechanical Handling.

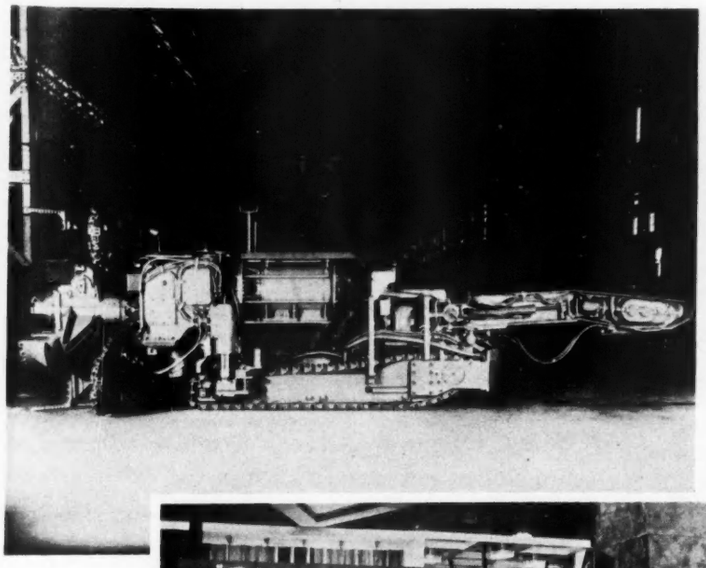
Salary scales up to high level in accordance with age, experience, technical and professional qualifications. Pension and Insurance scheme.

Write or telephone : 76, Victoria Street, London, S.W.1. Tel. : VIC 4674, or Beacon House, Queens Road, Clifton, Bristol. Tel. : Bristol 3-6817.

E6087 A

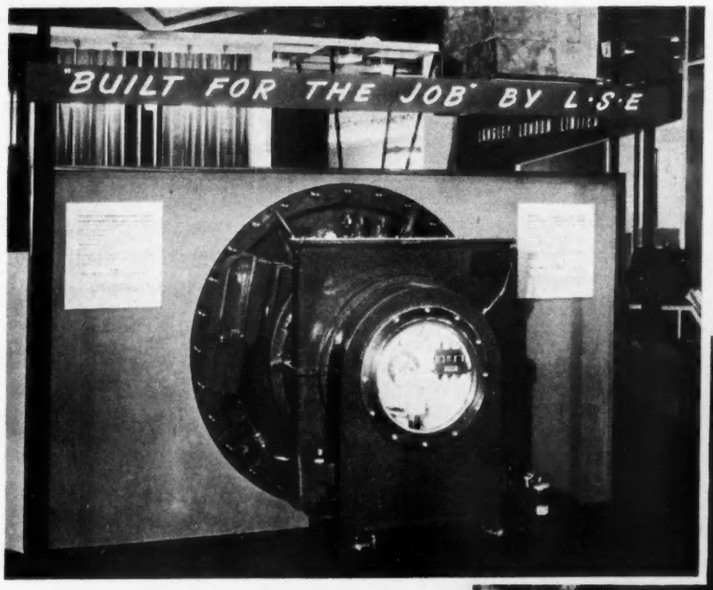
Classified Advts. continued on page 7

L.S.E. are electrical *engineers*

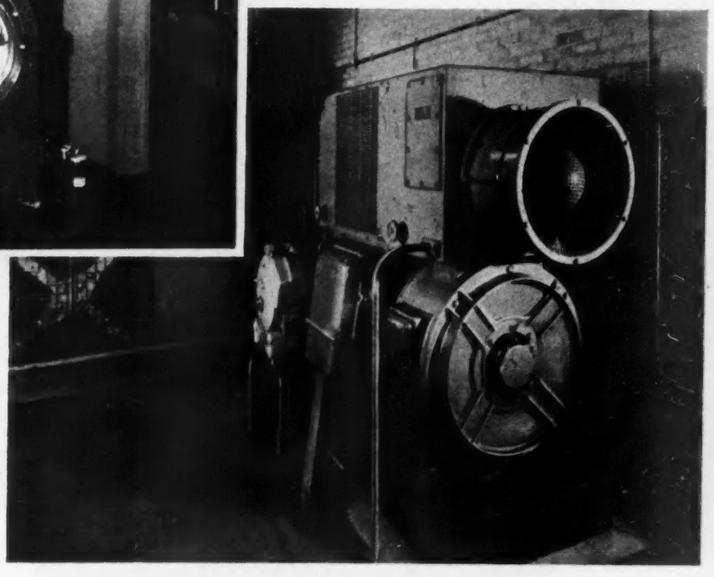


Many machine makers and production engineers, ingenious and indefatigable in developing more efficient, more exacting, and more fully automatic machines and processes, have come to rely on L.S.E. for electric motors and control gear to meet their individual needs.

This is something L.S.E. do rather well. For seventy-five years they have been making motors engineered for the job. It is an interesting occupation; perhaps you have a problem which might add to the interest?



(There are also men at L.S.E. who take a lively interest in the production of a wide range of standard motors and starters, mainly available from stock.)



Top: For this Goodman Continuous Miner special water-cooled motors, and control gear, were developed.

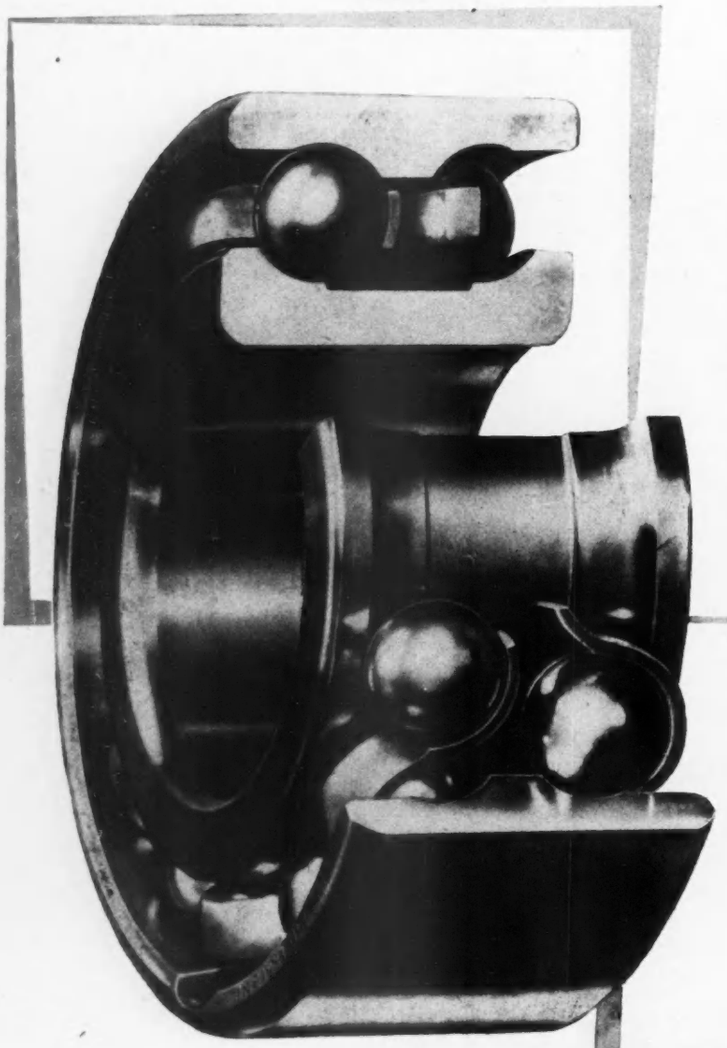
Centre: A 250 h.p. 3000 r.p.m. squirrel-cage motor designed (for the U.K.A.E.A.) to run for at least two years without shut-down.

Right: Revcon induction motor drive for a skip hoist. A single-unit machine giving a wide speed range (150/550/1400 r.p.m.) without frictional braking. Closed-air-circuit type.

LAURENCE, SCOTT & ELECTROMOTORS LTD

NORWICH MANCHESTER LONDON BRANCHES

Only SKF *can offer such a wide selection of British made bearings*



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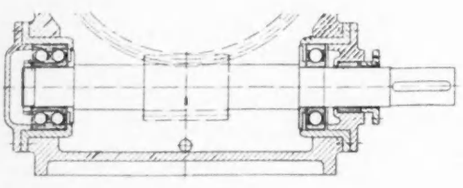

Worm shaft of worm gear unit

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THE ENGINEER

No. 5396 JUNE 26, 1959 VOL. 207

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The price of individual copies of this emergency issue and any further ones we may publish will be 6d. Direct postal subscribers wishing to claim a refund in respect of these lower priced issues are invited to write to The Manager, "The Engineer," 28, Essex Street, Strand, London, W.C.2.

THE PRINTING DISPUTE

A stoppage of work has now taken place at our printers ; and we have no information upon which to found an estimate of the length of the stoppage. This, therefore, is an "emergency issue." We hope to continue to publish such issues for the duration of the stoppage. We hope, with the help of printers' apprentices, to do so ; we regard it as our duty to try ; and we are determined, so long as it remains practicable to present a respectable looking issue to our readers, to continue publication.

WORK OF RESEARCH ASSOCIATIONS

A report on the work of industrial research associations has just been published under the title *Research for Industry*, 1958. Up till last year reports on the work of industrial research associations used to appear in the report of the Council for Scientific and Industrial Research. Following upon the change in status of that body, however, a separate report is now issued. Already —it is an indication that the potentiality was always there— it is beginning to have a distinctive character of its own. We are happy to see that it is so. For the work of the research associations is different from that of the D.S.I.R. establishments. The newly established council is trying to make the distinction clearer than it used to be by concentrating in D.S.I.R. research laboratories on work of more fundamental or widespread importance or upon work of so expensive and, at the same time, so speculative, a character or whose results can so much expect to be applied only in the rather distant future that no industry can be expected to carry the cost. It expects an association to take on work of direct and more immediate interest to any given industry, to undertake some degree of sponsored research, and to provide an information service. It is also regarded as essential by the Department itself that association laboratories should undertake some fundamental studies.

There are, of course, certain dangers to be apprehended in trying to classify researches in this way. For example, a worthwhile research might not get started just because no establishment considered it to be within its field. But probably the greater danger is that of having too little classification. Resources are then liable to be dispersed over too wide a field ; and there is the probability of undue duplication of effort. Another danger arises out of the fact that industries to a large extent control their own research laboratories. It is the plain duty of a D.S.I.R. laboratory to publish, as soon as possible, full details of all the work it undertakes ; but there is no such clear duty applicable to a research association. Instead, it must maintain the secrecy of any sponsored research it undertakes ; and it is bound only to publish the results of other work to its members. But we do not think the danger is very extreme. A glance at the report before us relieves much of the fear. For it shows almost every association to have published some material during 1958, and the larger bodies, such as the British Electrical and Allied Industries Research Association and the British Iron and Steel Research Association to have published really substantial numbers of articles in the press, papers before learned societies, and reports and monographs of various kinds.

TEACHERS AT TECHNICAL COLLEGES

The numbers of full-time teachers in technical colleges has doubled in the last seven years and it has looked for some time as though the figure of 18,000 teachers by 1961, suggested as satisfactory by the Willis Jackson Committee of 1961 in its report on "The Supply and Training of Teachers for Technical Colleges," will be quite easily reached. But, as Mr. Part, Under-Secretary of the Ministry of Education, pointed out at a Southern Regional Council for Further Education at Oxford on June 11, the figures are less satisfactory than they seem. If there is to be more personal contact between students and teachers than in the past ; if more teachers are to be able to take training courses in various subjects ; and if they are to get refresher experience in industry, the Willis Jackson estimates will need to be quite substantially exceeded. Furthermore, it is disappointing that the number of graduates of technology entering technical colleges is, apparently, falling well behind the numbers estimated to be required. Why, one wonders ? Mr. Part mentioned a number of ways in which local education authorities and governing bodies could make teaching posts more attractive to graduates. They could be given more responsibility, they could be encouraged to maintain research and consultancy work, they should be made free to attend conferences and meetings of learned societies. He also stressed the importance of providing adequate common rooms, workrooms and clerical and laboratory assistance. Lack of experience of teaching may be a factor in preventing some graduates from applying for teaching jobs. But Mr. Part was able to point to the existence of teacher training colleges at Bolton, Huddersfield and London. Perhaps the primary reason why the numbers of graduates of technology is falling below requirements is just the sheer weight of the demand for them by universities, by research organisations and, increasingly, by industry.

Newcomen Society's Summer Meeting

THE Newcomen Society for the Study of the History of Engineering and Technology held its summer meeting in Somerset from June 2 to 5. This venue was chosen to enable members to pay their respects to the memory of Isambard Kingdom Brunel, the centenary of whose death falls this year. An exhibition of Brunel's sketch books, letters and instruments at Bristol University Library which had been specially arranged for the Society and which was presented to the University by his grand-daughter, Lady Noble, was seen by members, who also visited the Clifton suspension bridge and the swing bridge at the docks. Two examples of Brunel's chain-operated steam dredger of 1843, one at Bristol and the other at Bridgwater, exist, and the latter, in operation, was inspected by the party.

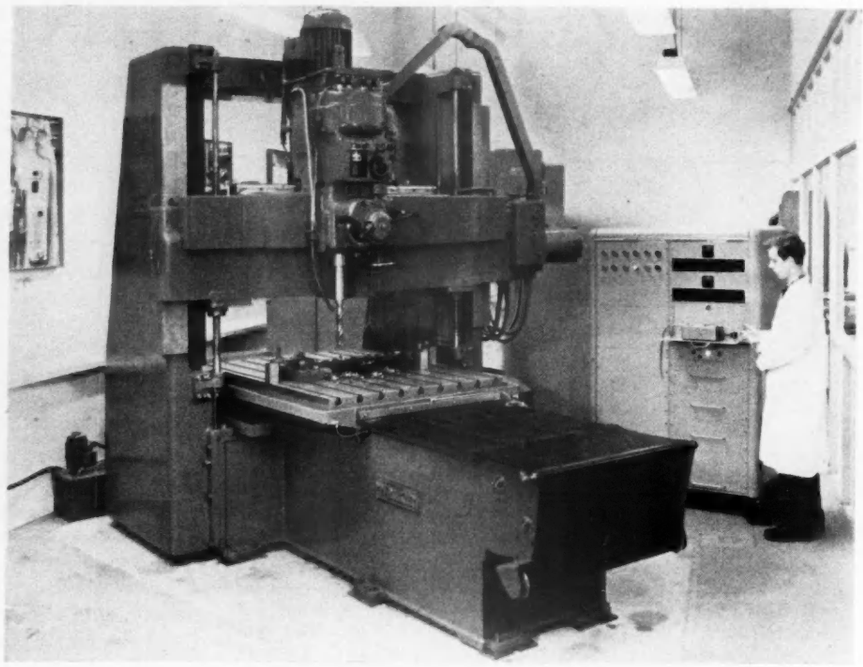
A substantial area of Somerset lies below sea level and is kept from inundation by the activities of the Somerset River Board. At the Curry Moor pumping station members were able to compare the early steam plant by Easton, Amos and Sons, Ltd., which is preserved alongside the much more compact diesel plant which fulfils the same duty. At Stanmoor they saw the same firm's vertical vee twin engine driving an Appold centrifugal pump ; this early plant is still kept as a standby and was seen under steam. At Gold Corner, the party saw a powerful modern pumping station in which had been set up a small exhibition illustrating the history of land drainage in Somerset. This station feeds the new river, 5 miles long, 200ft wide, which was constructed by the Board's chief engineer, Mr. E. L. Kelting, in 1939, as a reservoir to supply a new munitions factory. Local occupations particularly associated with this drainage area are peat cutting and basket-making from willow withies, both of which crafts were seen by members. A further example in the contrast between old and new pumping machinery was provided by the plant housed side by side in identical buildings at the Blagdon reservoir of the Bristol Waterworks Company. The obsolete set, still preserved, is a very late example of a compound beam engine, installed by Glenfield and Kennedy, Ltd., as recently as 1902.

The Society also visited three museums in the area, namely, Taunton Castle with Stringfellow's model of his aero engine, the Bristol City Museum with the earliest extant steam car in Britain, and the Blaise Castle House Folk Museum with its collection of craft exhibits and watermill in the park. The party, numbering fifty, under the presidency of Mr. A. Stowers, M.I.Mech.E., stayed at Weston-super-Mare, where the annual dinner was held.

Electronic Positional Drilling Machine

AN electronic positional drilling machine has been developed and built by Wadkin, Ltd., of Leicester, in conjunction with E.M.I. Electronics, Ltd., of Hayes, Middlesex. It is capable of drilling holes up to 2in diameter with automatic tape programming to within a stated accuracy of ±0·001in. As can be seen in the illustration this machine is of bridge construction and it has a 60in by 40in table with a maximum daylight of 40in under the bridge. The all-geared "Archdale" drill head is driven by a 5 h.p. motor, giving twelve spindle speeds from 60 to 1500 r.p.m. and six feed rates from 0·004in to 0·030in per revolution. If required a precision boring head can be fitted in place of the drilling head.

The table of the machine is fully supported on the bedways in all positions and is mounted on precision roller chain tracks. A 1½ h.p. motor which drives the table leadscrew through reduction gearing has Ward-Leonard control, and a similar drive is fitted for drill head traverse along the cross beam. The cross beam assembly is raised and lowered on the columns of the machine by a 1½ h.p. motor at 15in per minute. During drilling operations the table and drill head are automatically locked by a high pressure hydraulic clamping system. The elements used for fine measuring are mounted directly on the main machine structure whilst the associated coarse measuring systems are contained in reduction gearboxes driven from the leadscrews.



Drilling machine controlled electronically through a punched tape

Longitudinal positioning of the table and cross traverse positioning of the drill head or the beam is effected automatically over a complete drilling cycle by standard E.M.I. positioning equipment through punched tape control. Manual setting of the machine co-ordinates for prototype or similar individual workpieces can be effected through dial controls. When required a heavy duty guide bush can be fitted on the beam below the drill head and if required holes of up to 3in diameter can be drilled at reduced feed rates. Drilling depths are controlled by setting the stops on the drill head, and feed and speed changes are made manually, otherwise the complete drilling cycle is initiated from the main control cabinet.

Closed-Circuit TV for Document Viewing

WHEN the increasing volume of business at the city office of Barclay's Bank, Ltd., Fenchurch Street, London, E.C.2, made more ground floor space necessary, it could be provided only by moving the book-keeping section and accounting machines to an upper floor. The bank has therefore installed a closed-circuit television system by which pictures of documents may be transmitted from the book-keeping department, now three floors up, to selected positions and offices on the ground floor where statements and other papers frequently have to be examined.

A permanent installation has been built for the bank by Marconi's Wireless Telegraph Company, Ltd., Chelmsford, Essex. In the book-keeping department on the upper floor three television document viewing consoles are installed. Each console is, in essentials, a light-box with a lid at the top giving access to a glass screen on which the document to be viewed is placed. Inside the console a Marconi "BD871" television camera is housed horizontally, together with its control unit ; the camera is arranged to view, via a solenoid-operated rotatable mirror, one-half of the document area. Illumination is provided by two 75W spotlight reflector lamps.

Above the consoles, three Marconi 14in monitors are installed as seen in the illustration, each connected to one console to enable the operator to obtain a picture of maximum quality by adjustment of simple controls. Provision has been made for the installation of a fourth console and monitor if these should be required in the future.

Any one of the three viewing consoles can be routed to any one of eight 14in monitors on the ground floor, which are installed in managers' offices and at key positions on the counters. All monitors are aligned so that the picture is visible only to the executive requiring the information unless he invites the customer to a viewing position. Should the information required be on the lower half of the page, the executive himself operates a pushbutton on his small remote control panel. This re-orientates the

Transmission consoles and local monitor screens of TV system for viewing banking documents

mirror in the document viewing console upstairs and puts the other half of the page on the screen. When the picture is no longer required he presses another button which removes the screen presentation and also provides a visual "Cancel" indication to the operator that the display is finished with.

The system operates with direct video transmission over a 7 Mc/s bandwidth, on 625 lines and a definition of 400 lines per inch. These standards were chosen to give high legibility from ordinary typescript characters produced by the accounting machinery already installed. Circuits between the viewing consoles and monitors are of 75-ohm coaxial cable. The largest connection in this installation is some 250ft, but links up to 1000ft would be practicable. It was stated during an inspection of the system recently that at busy periods in the bank there may be a request to see a statement every two minutes and that without the television system it would be necessary to employ two messengers permanently for collecting and returning documents.

New automatic telephones have been installed in the building by the Reliance Telephone Company, Ltd., including connections between the viewing console operators and the ground floor monitor positions; and a Lamson tube system enables documents to be despatched to the monitor screen positions if required.

Rig for Cylinder Piles

A RECENT innovation in foundation work especially for heavily-loaded foundations in subsoil such as London clay, has been the use of large-diameter cylinder piles. These piles have belled-out bases and may be up to 80ft in length, and 7ft in diameter, with a base diameter of 15ft. A load of 2000 tons can be carried on a 7ft cylinder so that a more attractive design than with normal driven piles is offered in many cases. A principal example of the use of these cylinders in London is that of the foundations of the tower block of the "Shell" building now under construction on the South Bank site. The design of the foundations for the "Shell" building was explained in an article in THE ENGINEER of August 30, 1957. We also illustrated one of the rigs used to excavate the cylinders at the South Bank, in our last annual review supplement, and similar rigs were illustrated in use at Bradwell nuclear power station in THE ENGINEER of January 17, 1958. A further use of this equipment is the construction of retaining walls formed of concrete cylinders.

The cylinders are excavated by an auger mounted on a rig attached to a conventional excavator. The rig was designed by Economic Foundations, Ltd., and is offered as a foundation service by that firm, and was recently demonstrated to the Press. The accompanying illustrations show this rig in use, and the belling-out tool.

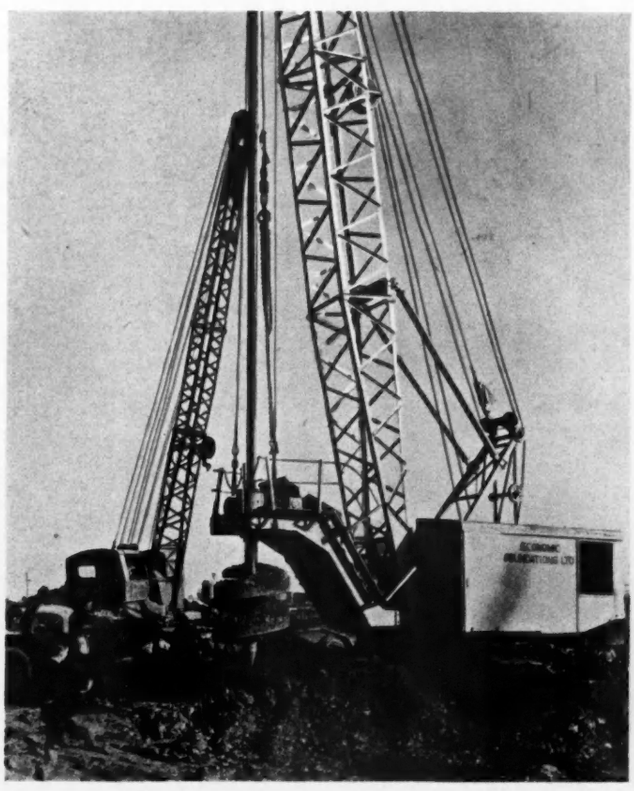
The simplicity and robustness characteristic of all widely-used constructional plant is apparent in the design of this rig. No modifications are needed to the standard excavator, a machine such as a 43 RB (of approximately 110 h.p.) being used for cylinders in the 4ft 6in to 7ft range of diameters, and a smaller machine for the smaller cylinders. The rig can be dismantled quite simply, leaving the excavator free for normal use. The auger is of welded mild steel with a hardened and toothed cutting edge and consists of two complete turns; it is taken out of the hole when "full" of clay, as shown in the illustration, and spun in reverse to unload it. It is carried on a square kelly with inner and outer sleeves which "telescope" in the hole to give the full depth of 80ft while still operating from the excavator jib. The belling-out tool is very simple, and is, in effect, a cylindrical skip with a door at the bottom, and cutting arms which, in their raised position, close slots in the wall of the tool. These arms are carried on a simple linkage such that that they are retracted when the tool is hoisted, but pivot out from the base of the tool when it is landed in the bottom of the hole. Rotation of the tool then "bells-out" the base, the excavated material being swept into it. An alternative design giving a different "belled-out" shape has also been developed.

For materials such as gravel, a lining ring can be put down to maintain the shape of the cylinder. Thus, although clay is the ideal material, it is considered that these cylinders can be used for a fair variety of subsoil strata, including quite hard materials. So far, claystone beds have been successfully excavated.

A second hoist rope on the jib pulley of the excavator allows immediate manipulation of the belling tool, or lining cylinders. The auger drive is mechanically straightforward with a chain drive through reduction gearing, giving a digging speed of about 12 r.p.m. However, the chain sprockets are split and bolted, and can be easily changed, so that a range of digging speeds of about 10–30 r.p.m. can be obtained by site adjustment. The auger is reversed through a gear drive at 36 r.p.m.

The drive from the excavator is through a fluid coupling, which is included in the drive to relieve the system of overload shocks. One other point of interest is a jacking arrangement which can be brought into use to give a downward thrust of several tons on the auger. The jacks have a stroke of about 18in; that is, they can be brought into use to complete a digging cycle and maintained in use until the auger is brought out of the hole and unloaded. The rams bear against a collar round the kelly, with a disc in the centre mounted on bearings in the collar so that it turns with the kelly. A spring-loaded bolt above the disc carries "fingers" below the disc. Toggle plates, located in the disc, rest lightly against the lower fingers, When the jacks are operated, the toggles then grip the kelly bar and transmit the jacking load to it. On raising the auger and the kelly, the top of the spring-loaded bolt strikes a bar, which compresses the spring and releases the toggle plates, thus freeing the kelly.

The maximum operating progress of the rig is given as 20ft depth of excavation per hour. In practical terms this can be interpreted, we understand, as a rate of progress—excavating the cylinder and then concreting it—of one 80ft cylinder per day. The use of an auger in conjunction with an excavator has been known in the U.S.A. on small machines. The idea developed here for application to large scale work and the method of drive connections and feed down are entirely British.



(Left) Excavator-mounted rig showing auger loaded with spoil being retracted for unloading. (Right) Belling-out tool for enlarging base of excavated cylinder

St. Lawrence River Development

V—The Lachine Section

The Lachine section of the Seaway, which extends round the South shore of the St. Lawrence River between the port of Montreal and Lake St. Louis, has chiefly occupied our attention in Nos. II, III and IV of this series. Description of the Lachine section is completed hereunder, with some information on the design of the Seaway at Cote Ste. Catherine lock, and on the reconstruction of the Honoré Mercier road bridge.

THE vastness and complexity of the St. Lawrence Seaway have made it necessary, in the last two parts of this series, to depart somewhat from the simple plan of describing this great ship canal by following its course from Montreal upstream to the Great Lakes. Thus our description so far has included a general account of the lock gates and equipment, and of lifting bridges, since both of these topics were inevitably introduced in describing the first lock at St. Lambert.

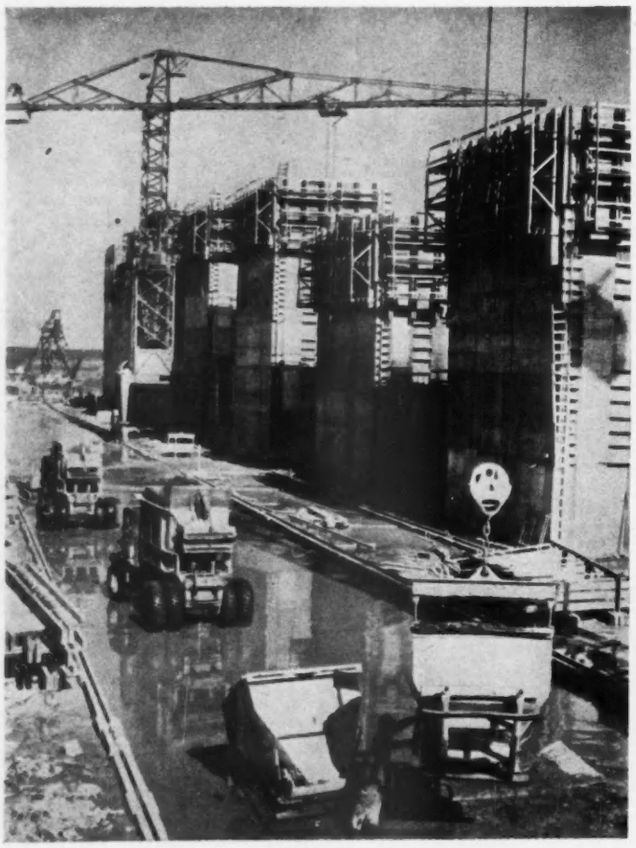
We now return to the original sequence, and recall that all the works up to St. Lambert lock have now been described, together with an account of the construction of the canal itself—principally an earth-moving task—in the Lachine section as a whole. Above St. Lambert lock, the Seaway follows a broadly curved path round the Laprairie basin to Cote Ste. Catherine lock, complicated only by the provision of two turning basins, and of substructure works for a new bridge which it is planned will be built later on from Nuns Island to the south bank of the St. Lawrence.

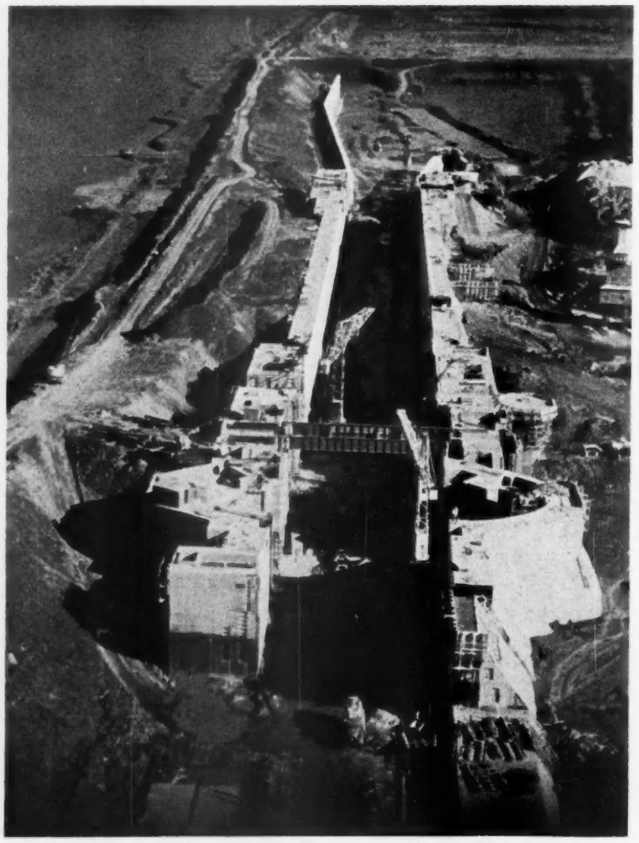
At Cote Ste. Catherine lock, the general layout is simpler than at St. Lambert. The lock itself merits little further description than that already given in No. III. It proved a convenient site for early construction and work was, in fact, under way here earlier than at St. Lambert, and the constructional schedule was thus correspondingly less frenetic. Road communication across the lock depends on a rolling lift bridge.

Cote Ste. Catherine lock, like St. Lambert lock, is founded on shale. Excavation within the lock cofferdam was sealed, as at St. Lambert, with a spray coat of bitumen to prevent deterioration of the exposed rock surface. The lock walls, which are of gravity section, were built in 10ft lifts with tower cranes, as Fig. 20 shows. This work is thought to be about the first occasion when tower cranes (they are of French manufacture) have been used for constructional work on the North American Continent. Concreting plant at the site consisted of three 2 cubic yard mixers, i.e. about half the capacity of the corresponding plant at St. Lambert lock. The concrete guide walls extend for 1600ft, both upstream and downstream from the lock, and they diverge at 1 in 12 for 900ft. Travelling forms were used to construct these walls, with higher lifts of concrete than for the main wall construction, lifts of 24ft and 33ft being employed. Fig. 21 gives a good general idea of construction at this site.

The position of the lock was influenced by the hydro-electric development envisaged for the Lachine Rapids. The dam would abut on the south shore just upstream from the lock ; the upstream guide wall on the north side would join on to the concrete work of the dam and an additional area of land would be reclaimed between the lock and the power house. The north guide wall has been built with provision for sluice gates to be installed. The sluiceways are very large, there being eight openings, with a discharge capacity of 40,000 cusecs. They are at present blocked-off with steel sheet piling, backed by the rock-fill of the embankment. However, on completion of the Lachine Rapids power station, they would be fitted with gates, which would operate only after the end of the navigation season, at the time when ice is forming.

Trouble-free winter operation of the St. Lawrence power stations depends partly on encouraging the formation of an unbroken sheet of ice over as large an area of the head





Figs. 20 and 21—(Left) An early stage in the construction of Cote Ste. Catherine lock, showing concreting of the gravity walls of the lock in progress. Note the shuttering for 10ft lifts, tower crane and concrete skips and trucks. (Right) Cote Ste. Catherine lock at a fairly advanced stage of construction. Note the sector gate recesses and the main girders for the rolling lift bridge. On the left and in the background are the cofferdam embankments, and a guide wall has been built in the background

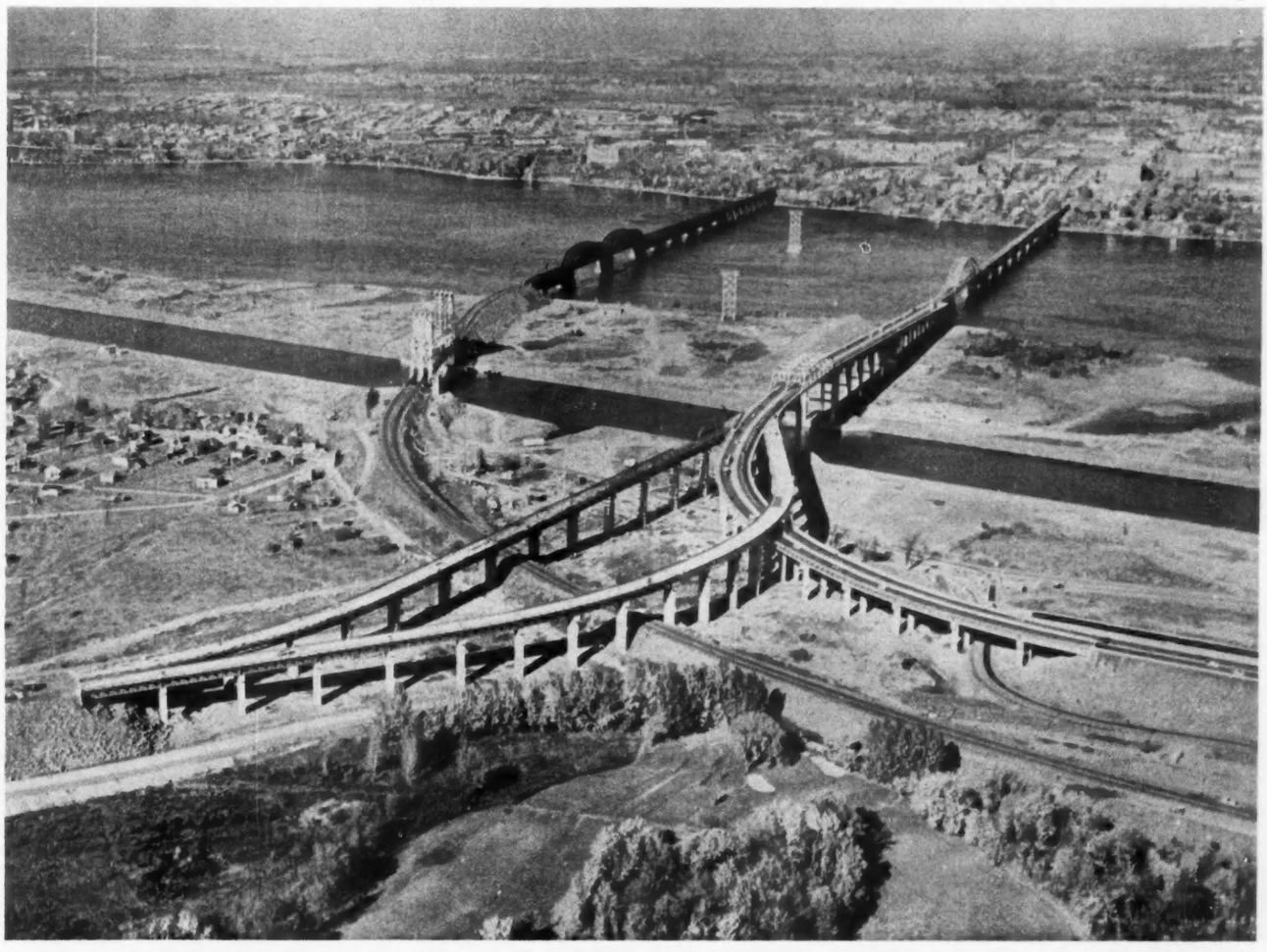


Fig. 22—Road and rail bridges at Caughnawaga with the Seaway in the middle ground and the St. Lawrence River behind it. On the right is the Honoré Mercier bridge, showing reconstruction of the south shore approaches nearly completed. On the left are the twin lifting bridges of the C.P.R.

race as possible, at the earliest possible time. To do this, the velocity of flow must be reduced, the limiting value taken in design for this period being 2·5ft per second. Since navigation will have stopped by the time these conditions arise, an increase in flow, above the limit imposed in the navigation season of 4ft per second, is tolerable in the Seaway, provided no scour results. The channel upstream from Cote Ste. Catherine is, in fact, adequate to resist scour at higher velocities, so river flow would be diverted through it from Lake St. Louis, to reduce the head race velocity to 2·5ft per second, and also to scour out frazil ice, and then discharge back into the river at this sluice gate installation just above the lock, from which the Quebec Hydro-Electric Commission would construct a spillway.

Other features, in addition to this "blocked-off" spillway, include a reservoir for locking water and surge control, immediately upstream of the lock and extending on the inland side of the Seaway. A regulating channel controlled by Tainter-gate ground sluices, parallel with Cote Ste. Catherine lock, leads from the reservoir to the Laprairie basin drainage area. With normal upstream water level, 5000 cusecs can be discharged through this channel. Upstream from the reservoir, and again on the landward or southern side of the Seaway, is the area reserved for development as a port. In this first stage of construction, the Seaway has been widened to 280ft, and a quay wall is being built over a length of 4000ft. It is of reinforced concrete construction, tied back into the rock. There is plenty of space at this site for future development of a port, which will, of course, depend on the success of the Seaway project in its entirety, in generating traffic and economic activity. It may be mentioned, however, that the cost of development of these quays at Cote Ste. Catherine is considered to be about 25 per cent of the cost of providing similar facilities in Montreal. If the Seaway develops in the manner which is hoped, this will only be one of a number of new ports which will depend on it for their traffic. Other major port works are being undertaken at cities situated on the shores of the Great Lakes, such as Cleveland, Toledo and Milwaukee.

About a mile of new highway had to be built to replace the former road at Cote Ste. Catherine, as a similar reconstruction was needed to the east of the Honoré Mercier bridge. For the construction of Cote Ste. Catherine lock itself, and its approaches, the contractors were the Canamont Construction Company, Ltd. and Canit Construction, Ltd.; the contractor for the wharf and other subsidiary works was P. Baillargeon Ltée.

Honore Mercier Bridge

One other major bridge reconstruction was undertaken in the Lachine section of the Seaway, namely that of rebuilding the Honoré Mercier road bridge to give the stipulated 120ft clearance. This bridge is close to the pair of lifting bridges at Caughnawaga, and these bridges are all shown in Fig. 22, which gives a very good idea of the whole area, and of the St. Lawrence River just upstream from the Lachine Rapids. The town in the left background is Lachine.

Complete reconstruction of the approach spans on the south shore was called for at the Honoré Mercier bridge, in contrast to the insertion of lifting bridges or the jacking of existing spans, as described for the other bridge sites, since these more economical methods were inapplicable here. While reconstruction was in progress, traffic was diverted from the bridge at the south shore on to a temporary embankment. Part of this embankment can be seen to the left of the bridge in Fig. 22, but at the stage shown most of the embankment, and in particular that part of it crossing the Seaway channel, has been dug away. Incidentally, the original position of the C.P.R. railway embankment, before the two new lifting bridges were brought into use, can also be discerned from the small remnant of embankment still visible to the left of the lifting bridges.

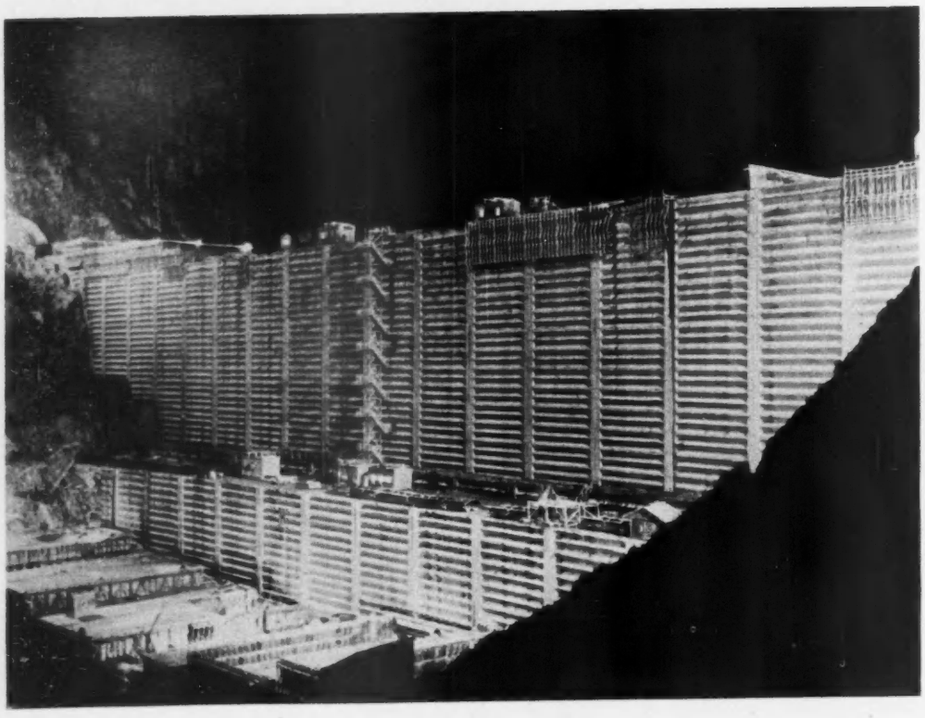
Honoré Mercier bridge, before reconstruction, consisted of nine single spans on the north side, then a continuous tied arch with 235ft, 400ft and 235ft spans, and then twenty-five 50ft approach spans on the south shore. It is these last twenty-five spans which have been demolished, and replaced by the complex arrangement shown in Fig. 22. The old bridge has a 27ft carriageway, but as can be seen, the newly constructed part gives dual carriageway standards and completely separated traffic streams, the north-bound traffic sharply turning into the old bridge roadway where the new construction joins the old.

The new construction consists of struc-

Swiss Power Schemes

On page 10 of the Swiss Supplement published with last week's issue of "The Engineer" we reviewed Swiss hydro-electric schemes. Here some complementary information is given. Our illustration at the bottom of this page shows the Grande Dixence dam under construction. Until its completion, the world record for height will be held by the 237m high Mauvoisin dam (RIGHT). The Mauvoisin scheme, which we described very fully in a series of articles in April-June, 1954, is situated in the neighbouring Val de Bagnes. It is an arch dam with a crest length of 535m, a maximum thickness of 53·5m and a thickness at the crest of 14m. Of a total concrete volume of 2,030,000 cubic metres, 96 per cent was placed in the three seasons 1955–57, with a maximum rate of 8037 cubic metres in a day. The entire scheme was completed last year after seven-and-a-half years of work, at a cost of 450 million Swiss francs. The dam required the excavation of 1,400,000 cubic metres of rock and loose material; 430,000 tons of cement were brought up on a 14km-long cableway. A 190,000 square metre grout screen necessitated 38km of drilling. The reservoir stores the equivalent of 537 million kWh. The water is utilised in two stages: in the 4·75km distant power station of Fionnay (Mauvoisin), where three vertical Francis sets operating under a gross head of 474m, produce 127·5MW; and Riddes, which is in the Rhone valley, has five double horizontal Pelton sets of 225MW. The whole scheme utilises 250 million cubic metres of water per annum and generates 760 million kWh, 80 per cent of it in the winter.

Some 4km upstream from Sion the waters of the Lienne reach the right bank of the Rhone from the southern slopes of the Rawil massif, representing a catchment of 58 square kilometres. The two main power stations of Electricite de la Lienne S.A. are Croix, an underground station at 921·7m.s.l., and St.-Leonard, in the Rhone valley. Between them they produce 184 million kWh per annum, 83 per cent in the winter. The principal reservoir of 85 ha holds 50 cubic kilometres between water levels of 1777m and 1670m.s.l. Its main structures are the Zeuzier dam, a 330,000 cubic metres arch dam 160m high and 256m along the crest, and 7m and 26m thick at the crest and base respectively; and the adjoining Proz-Riond earth dam, both of which are shown (LEFT). The earth dam has a volume of 60,000 cubic metres, is 20m high and 160m long. A substantial apron had to be grouted over the whole width of the site, reaching to 150m below ground by the side of the arch dam. The turbine installations comprise two horizontal Peltons at Croix (55·9MW, maximum gross head 854m, flow 7·5 cumecs) and two vertical Francis sets at St.-Leonard (28·6MW, 417m gross head, 8·5 cumecs).



In spite of its great height, Grande Dixence is a gravity dam. For an arch design, sufficient height to give the required reservoir capacity would have been very difficult to obtain at the present site. An alternative site further upstream would have solved this problem, at the expense of enormously increased excavation, and encroachment on the existing dam (now submerged), with consequent closure of Chandoline power station. The gravity design was thus chosen, particularly since it lent itself to multi-stage construction.

The dam is shown (LEFT) illuminated for night-time concreting and the slotted vertical faces constructed between the two main stages of construction, as explained in the Supplement, are well shown.

tural steel spans on concrete piers. The piers are mainly about 50ft in height, but at the Seaway crossing they are 110ft high. Proceeding from the older part of the bridge there is first a simply-supported 55ft " deck " truss and then 1424ft of continuous " deck " trusses in twelve spans, up to the Seaway crossing. At the crossing the bridge consists of " through " trusses spanning 300ft. From the Seaway crossing, the central part of the bridge (i.e. the carriageways leading to and from the embankment on the right-hand side of Fig. 22) then consists of 1500ft of deck plate girders in approximately 100ft spans, and the other two branches consist of 1700ft and 2000ft respectively of similar construction. The total length of steel spans constructed was about 7000ft, requiring 10,000 tons of fabricated steel.

After constructing the " turn-off " embankment, the approach spans of the old bridge were demolished by blasting. The new concrete piers were largely constructed by climbing shuttering, actuated by hydraulic jacks climbing up centrally-placed rods. The steelwork, after the erection of end-spans, was erected mostly from the high level.

The St. Lawrence Seaway Authority's consulting engineers for the Honoré Mercier reconstruction were Messrs. Lalonde and Valois, and the superstructure contractor was the Dominion Bridge Company, Ltd. For the piers and substructure the contractors were the Pentagon Construction Company, Ltd., and J. D. Stirling; and for the demolition and the temporary approach embankment the Atlas Construction Company, Ltd.

About half a mile upstream from the Honoré Mercier and Caughnawaga bridges, the Seaway " cut " emerges into Lake St. Louis. This was a critical point in design, and was studied on a hydraulic model, since complication is caused in the hydraulic conditions by the influence of flood discharge into Lake St. Louis from the Ottawa River. The problem was solved by locally widening the dredged channel in the lake. This channel, the course of which was indicated in Fig. 4 in No. II of this series, leads to the Soulanges section, where ships leave Lake St. Louis at the Beauharnois locks. The dredging in Lake St. Louis was carried out by Marine Industries, Ltd.

(To be continued)

Dismantling Old Bridge Over the Tugela River

BY OUR SOUTH AFRICAN CORRESPONDENT

After more than half-a-century of service in Natal, the railway bridge across the Tugela River at Colenso, crossed during its service by more than half-a-million trains, is being moved to South West Africa to start on a new lease of life. The doubling of the Natal main line meant the end of the road for the single-track bridge at Colenso, but instead of being scrapped it will be dismantled and transported by rail to the crossing over the Khan River on the line between Kranzberg and Tsumeb. In the meantime, an impressive five-span, two-track reinforced concrete bridge has taken its place over the Tugela River. The old Bethulie bridge over the Orange River on the Cape Eastern main line, is another bridge about to be transferred to South West Africa. A concrete bridge consisting of 68ft reinforced concrete deck spans carrying 96 lb rails has been constructed to replace the old one equipped with 81 lb rails. These bridges will bring about substantial economies in the broadening in South West Africa of the 2ft to the standard 3ft 6in gauge, estimated to cost about £6,000,000.

Where the old bridge crosses the Tugela, the river is fairly wide, while its depth is normally about 17ft. The height from the normal water level to the underside of the bridge is about 34ft

The method used to dismantle a 50-year-old bridge over the Tugela River was to link all the spans together and haul them bodily ashore at one end. The picture shows the structure during the process of hauling

and the execution of falsework to this height was considered uneconomical. The method used to remove the bridge is therefore of some interest. We are indebted to South African Railways for the photograph reproduced herewith. It shows the bridge being pulled across the river. A portion of the new bridge can be seen in the background.

To make this method of dismantling the bridge possible, special preparations had to be made. The entire structure was removed from between the main girders, which were then brought closer together, to 5ft centres, so that they could be braced together at the bottom on standard wooden sleepers, 7ft long. These sleepers were spaced 2ft 3in apart and packed so that the underside of the sleepers provided a level surface for two 80 lb inverted rails placed dead centre with each main girder. Launching rollers were placed on the pier tops and carefully lined up. The steelwork was then manipulated on 100-ton hydraulic jacks until the rail heads rested between the flanges of the rollers. The five spans were joined together end-to-end with cover plates bolted across the ends of the top and bottom booms. A launching nose extending 15ft was fitted to the trailing end of the spans to reduce the stresses which would vary continually as the long length of bridge work was moved over the rollers. The steelwork, which weighed about 400 tons, was then pulled across the river by means of a 5-ton hand winch, the wire rope passing through sheave blocks for additional control and extra power if required. Due to lack of space, the operation was performed in two stages. During the first stage the steelwork was moved out far enough for two spans to be dismantled, and during the second stage the remaining three spans were removed.

The individual rollers used to support the bridge were only 5½in in diameter and were fitted with roller bearings, each capable of carrying a maximum load of 15 tons. To cope with loads of up to 120 tons on each pier, the rollers were mounted in special housings which provided sufficient articulation to ensure that each roller in a group carried an equal share of the load. The housings were of " all-welded " construction, each comprising four parts that could easily be manhandled without the use of any lifting gear. No bolts whatever were used in the assemblies, and when assembled each unit was only 22½in high

Mechanisation of Railway Maintenance

BY OUR SOUTH AFRICAN CORRESPONDENT

Ballast tamping machines, used for consolidating ballast under railway sleepers are making their appearance in many places along the permanent ways in South Africa and it is estimated that the twelve machines now in the service of the South African Railway Administration are doing the work of approximately

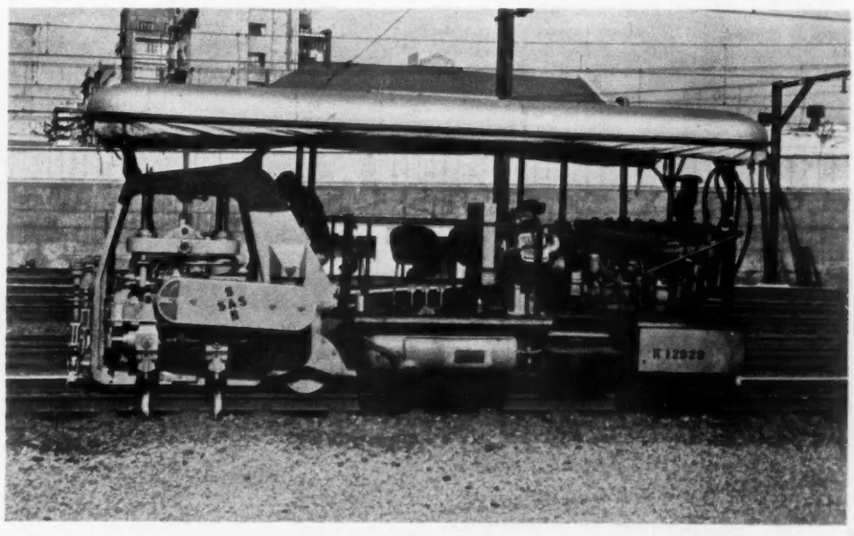


Fig. 1—A ballast-tamping machine in operation

1000 workmen. Actually the on-track tamper, of which there are two in service on preliminary work, is capable of tamping more than six sleepers per minute, not only doing the work done by 120 labourers, but also doing it to a uniformly high standard without interruptions and under all weather conditions. The mechanically tamped track has, in the opinion of engineers, proved to be more durable and resistant to movement than the hand tamped track. This is borne out by the fact that the machines do the job so well that it is unnecessary to re-tamp the track for periods two to three times as long as would be the case with hand labour. The Orange Free State rail system will be the first on which track maintenance will be fully mechanised probably within the next year

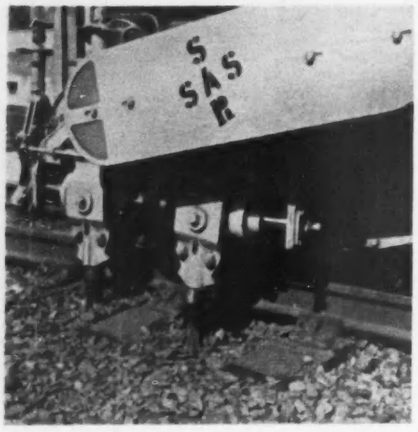


Fig. 2—Close-up view of tool frame mechanism showing tamping tools in the ballast

or so. The two on-track tamping machines mentioned above are operating on the double track from the Free State border on the Vaal River to Bloemfontein, a distance of 210 miles, and reports received of their performance are very satisfactory. The machines, which cost from £12,000 to £14,000 each, are capable, on the average, of tamping about a mile of track per day, whereas a gang of approximately fifty workmen takes two days to tamp the same distance.

The tamping machine, a view of which is shown in Fig. 1, driven by a 75/90 h.p. diesel motor, has sixteen vibrating tamping heads. The whole tamping mechanism is lowered into the ballast with the heads spread apart; these are then forced together, driving the ballast under the sleeper. The tamping mechanism is then raised, and the machine is propelled forward to the next sleeper. The whole cycle takes about ten seconds. The tamping is performed by two independently-operated tool frame mechanisms, each of which is equipped with eight tamping tools or "beater-bars," which are in a constant state of high frequency vibration imparted by rotating eccentrics. A close-up view of this tool frame mechanism is shown in Fig. 2. As each sleeper is reached the operator lowers the frames (one or both as required) with the tools in the open position. As the tools penetrate the ballast they are forced or "squeezed" together at a predetermined pressure and the combined action of the vibration and squeezing compacts the ballast firmly and evenly under the sleepers. The diesel unit, in addition to providing compressed air and hydraulic pressure for imparting the various motions to the tamping tools, also drives the machine along the track at speeds of up to 25 m.p.h.

The machines carry their own turntables and sidetracks to facilitate removal from the line to allow trains to go through. When it becomes necessary to remove a machine equipped with a turntable it is run on to the turntable which fits over the main tracks and is then turned and run on to side tracks, after which the turntable is removed by hand and the main tracks left unobstructed. In the case of machines which only have sidetracks without a turntable, they are equipped with small wheels mounted crosswise, which are lowered on to the sidetracks placed across the normal track under the machine. The machine is then lifted hydraulically on these wheels until it is clear of the main track, and moved sideways. The portion of the sidetracks which overlap the main tracks are then swung back on hinges to clear the obstruction. However, total occupation of the track is considered the safest form of working, and trains are, therefore, as far as possible, not allowed on the track while the machine is working in any particular section.

Large Centre Lathes for Rocket and Missile Work

BY OUR AMERICAN EDITOR

THE Sidney Machine Tool Company, of Sidney, Ohio, has announced its new "Space-Master" series of centre lathes, designed particularly for the rocket, missile and allied fields as well as for use on other large parts requiring precision. The machines are available in swings up to 72in and centre distances ranging up to 50ft. The new lathes are available with or without a fluid tracer. They employ a sixteen-spindle-speed headstock with lapped herringbone gears.

The headstock bearings are precision taper roller bearings. For thread and feed changes sixty ratios are provided. For infinitely variable speed operation, the lathes are available also with d.c. motor drive. A power-operated rapid traverse has multiple screw supports and operates in a totally enclosed housing. A safety clutch prevents damage if the carriage should run into an obstruction. The fluid tracer may be equipped with periscope mirrors which permit watching the tracer and template from the front of the machine.

The "Space-Master" has a double-walled apron for the rigid support of all shafts and studs. The lathe bed is also heavily bridged to ensure rigidity and accuracy. Chips are shed through ports in the rear wall of the bed. An important improvement over conventional lathe beds is the use of a separate rack for the tailstock pawl. All such parts as the tailstock base, carriage and bottom slide, swivel on the bottom slide, and the top slide on the swivel, have large support areas to prevent deflection and provide maximum support. The tailstock bore is honed and provided with ball thrust bearings to take thrust in either direction. A rapid approach and withdrawal of tools is provided for through a three-way valve operated by a lever at the front of the carriage. The tracer itself is operated through a separate power unit with its own separate control switch, so that the motor may be shut off when the tracer is not in use. The tracer permits the use of either flat or round templates.

Appointments

MR. R. HUGHES has been appointed assistant general manager, and Mr. E. T. Lodge, works manager, of Head Wrightson Stockton Forge, Ltd.

PROFESSOR JOHN STUART ANDERSON, F.R.S., has been appointed director of the National Chemical Laboratory, Department of Scientific and Industrial Research. He will succeed the retiring director, Dr. D. D. Pratt, in October.

APPLEBY-FRODINGHAM STEEL COMPANY has announced that Mr. P. A. Dixon has relinquished his position as steel works engineer, due to ill health, but will continue to undertake special duties with the chief engineer. Mr. E. A. Atkin, acting steel works engineer, has been appointed assistant chief engineer. Mr. D. R. M. Nisbet, deputy chief electrical engineer, succeeds Mr. W. E. Smith as chief electrical engineer on the latter's retirement. Mr. R. B. Atkin has been appointed steel works engineer, and has been succeeded as senior civil engineer by Mr. L. J. Sutherland.

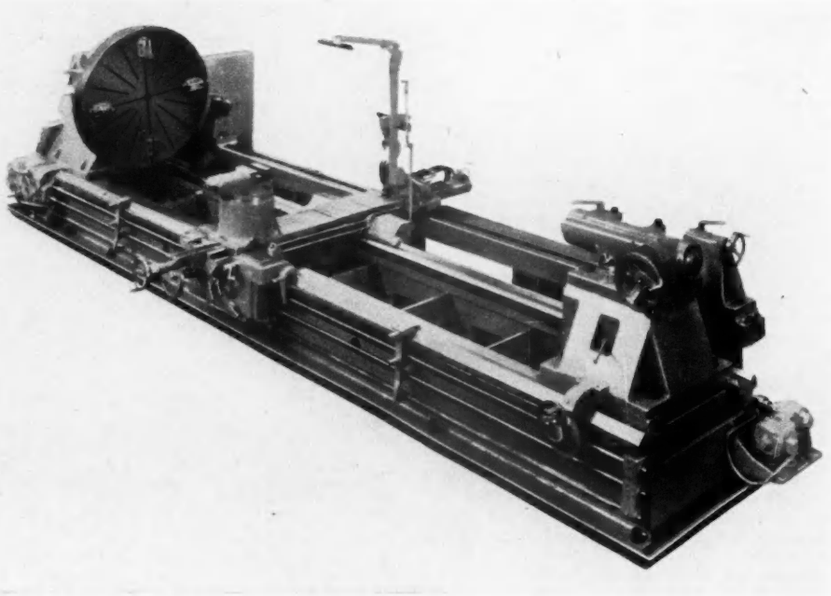
Business Announcements

THE MACHINE TOOL TRADES ASSOCIATION announces that Mr. Guy Chesham, public relations officer, has resigned from the association.

THE IRANIAN OIL EXPLORATION AND PRODUCING COMPANY and the IRANIAN OIL REFINING COMPANY have announced that Mr. K. Scholtens will retire from his posts as chairman of the boards and general managing director of the companies on July 1. Mr. E. W. Berlin, deputy managing director of the operating companies, will succeed Mr. Scholtens.

Contracts

THE ENGLISH ELECTRIC COMPANY, Ltd., has been awarded a £3,000,000 contract to build Australia's first two 200MW steam turbo-alternators for the Electricity Supply Commission of New South Wales. The remainder of the £4,750,000 order (condensing and feed heating plant) will be made in Australia to English Electric designs. The plant will be installed at a new power station at Vales Point, 70 miles north of Sydney on Lake Macquarie. When complete the station will have a capacity of 1500MW. The 200MW, 3000 r.p.m. steam turbine is a three-cylinder in-line machine with a double-casing impulse type high-pressure cylinder. Steam enters the turbine stop valve at 2350 lb per square inch gauge, 1050 deg. Fah. It is reheated and passed to the i.p. cylinder at 455 lb per square inch gauge and 1000 deg. Fah. The i.p. cylinder is combined with one section of the three-flow, low-pressure cylinder. The three-flow low-pressure cylinder exhausts to a single-shell condenser, the vacuum at the most economical and continuous maximum rating being 28·4in Hg. (Bar 30in). A six-stage feed water system gives a maximum temperature of 460 deg. Fah. at C.M.R. There is provision for off-load deaeration of feed water. The alternator is hydrogen cooled with direct cooling of the stator and rotor conductors at 30 lb per square inch gauge.



"Space-Master" 72in swing centre lathe by the Sidney Machine Tool Company

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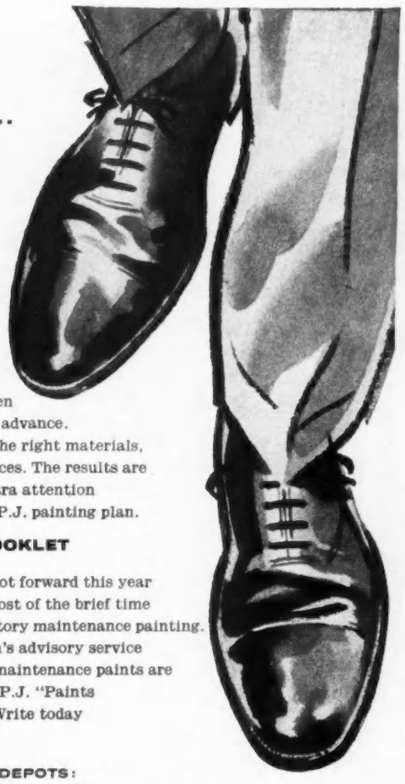

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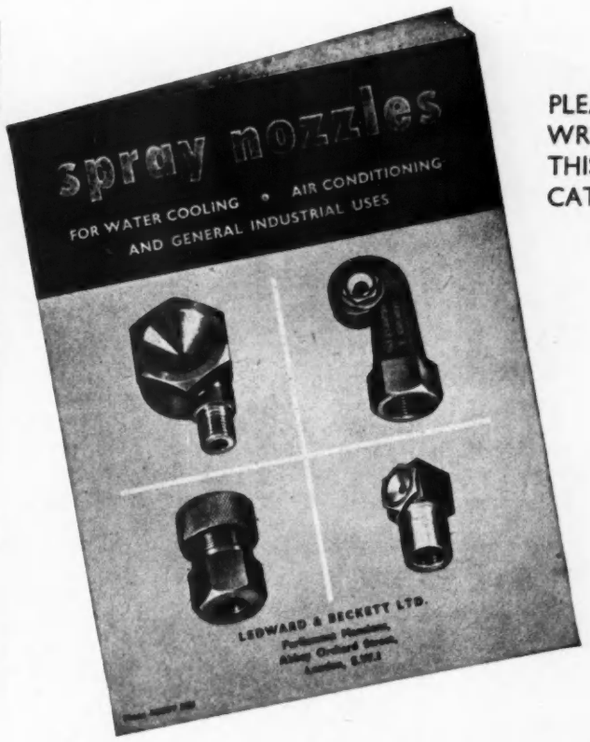

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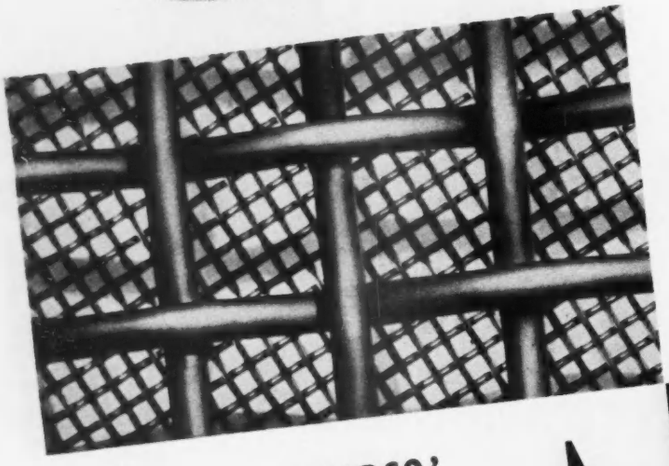

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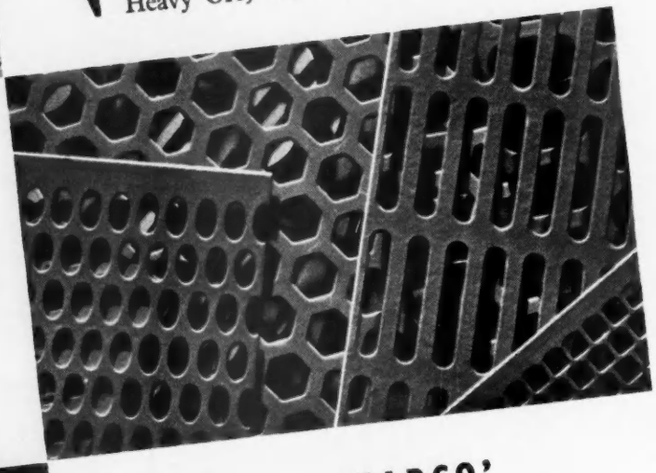

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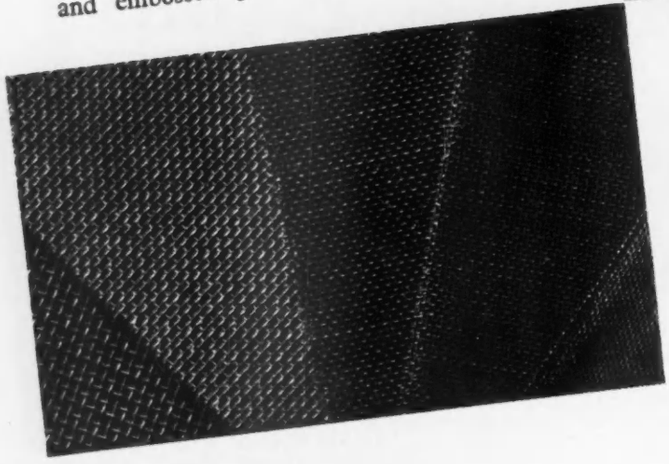

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E205 G

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Edwards

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TWW

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Classified Advts. continued on page 8

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E147 G

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BOX No. E2446, "The Engineer." G

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